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of the way in which pupils are to answer them, accompanied by many illustrations; so that this part of the book might almost be used as a guide for elementary plant physiology and anatomy.

The fourth course begins with a somewhat detailed presentation of the bacteria, after which the book breaks off suddenly with a recommendation that pupils study a list of fourteen cryptogams, closing with the sexual reproduction of the phanerogams and a synopsis of the whole system.

There is much good advice and suggestion in Dr. KIENITZ-GERLOFF'S book, but like all such books it plans a course which is far beyond the possibility of execution in the time allowed. Naturally it demands a well-prepared teacher, and when once a school has that factor, the problem is practically solved. To such this book will be helpful if it does not suggest overcrowding. (And to everybody it would have been more helpful had a good index been provided.)

It is interesting to see that the ideals as to the content and method of botanical instruction in the higher schools in Germany and America are so nearly identical. But we fear Germany will long outstrip us in the practical application of these ideals unless superintendents are more alive to the necessity for the thorough training in botany of those to whom they commit such teaching.—C. R. B.

MINOR NOTICES.

POND[2] has been studying the relation of aquatic plants to the substratum. After an introduction and a historical résumé of the subject, he gives the details of a series of carefully conducted experiments on the growth of aquatic plants under different soil conditions. The plants experimented on were *Vallisneria spiralis*, *Ranunculus aquatilis trichophyllus*, *Elodea canadensis*, *Myriophyllum spicatum*, *Potamogeton obtusifolium*, and *P. perfoliatus*. The result of the experiments seems to prove clearly that these plants are dependent for an important part of their food on the substratum in which they are rooted; that there is an upward current through the plants; and that the roots serve not only for anchorage but also for absorption. He shows that most of these plants have root hairs through which absorption takes place. It is evident that the establishment of the fact of root absorption in aquatic plants is an important addition to botanical knowledge; but it has a wider and more important interest in connection with the problems of the relationships of the animals and plants in our lakes to each other and to their material environment. The introduction and the final discussion of the experiments serve to bring out very clearly the important bearing of these results on plankton problems. Without doubt most authors have supposed that aquatic plants draw their nutriment from the medium in which they live. This being the case, the general conclusion drawn by KOFOID, that submerged aquatics are accompanied by a relatively small amount of plankton, is easily understood. For if the plants draw their food from the water, there is less left for plankton plants; but if these plants draw their food from the soil, they will, through this and their subsequent decay be adding to the material in the water which is available for the plankton organisms. In the discussion is brought out the way in which the work of KOFOID and of POND may be harmonized. In conclusion, the author points out the logical inference that a fish pond should have a good soil at bottom on which plants may grow and flourish, and thus add to the food available for fish. The problem of the relationship of the aquatic animals and plants is so complicated, however, that while the author ought to point out these inferences, less value attaches to the economic conclusions than to the main thesis of the paper. The paper is valuable as being a definite contribution to knowledge on a question which has been hitherto in doubt, and it is the kind of work that is much needed in solving the problems of the plankton. In the absence of just such work as this, much of our plankton literature has been speculative in character; and while there is a real value to be attached to good guessing, in the long run we must have demonstrated facts as the basis of our theories.—C. DWIGHT MARSH.

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[2] POND, RAYMOND H., The biological relation of aquatic plants to the substratum. From U. S. Fish Com. Rep. for 1903.

MISS EASTWOOD[3] has prepared a popular manual of the trees of California, the purpose being to give all the information necessary for identification so compactly that the book may be carried into the field. The numerous plates add greatly to the value of the book, many of them being reproductions of drawings left by Dr. ALBERT KELLOGG. Three keys are provided: the first based upon leaves, the second upon fruits, and the third upon the usual taxonomic characters. The trees of Oregon and Washington also are included, being placed in footnotes in case they do not occur in California. The only new species is *Quercus Alvordiana*.—J. M. C.

THE RELATIONSHIP between Sigillaria and Lepidodendron has been the subject of much discussion, and in connection with it *S. vascularis* and *L. selaginoides* have been prominent species. The identity of the two species has been urged and largely accepted upon evidence obtained from a study of their comparative anatomy. WEISS and LOMAX[4] have now described a specimen consisting of a stem of *S. vascularis* giving off branches of *L. selaginoides*. This demonstration of actual continuity closes the discussion.—J. M. C.

THE TWENTY-FIRST PART of ENGLER'S *Pflanzenreich* is a presentation of the sub-family Pothoideae of Araceae by ENGLER.[5] The sub-families of this family will be published in separate fascicles. Ten genera of Pothoideae are recognized, comprising 581 species, 489 of which belong to the great genus Anthurium, under which 55 new species are described. The next largest genus is Pothos, with 48 species, 5 of which are new.—J. M. C.

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[3] EASTWOOD, ALICE, A handbook of the trees of California. Calif. Acad. Sci. Occasional papers IX. pp. 86. *pls. 57.* 1905.

[4] WEISS, F. E., and LOMAX, JAMES, The stem and branches of *Lepidodendron selaginoides*. Manchester Memoirs **49**: no. 17. pp. 8. *figs. 4.* 1905.

[5] ENGLER, A., Das Pflanzenreich. Heft 21. Araceae-Pothoideae von A. Engler, pp. 330. Leipzig. Wilhelm Engelmann. 1905. *M*16.50.

BRAY[6] has published a description of the "sotol country" in Texas. The sotol is *Dasylirion texanum*, and gives name to characteristic areas of the arid southwest, whose vegetation is largely made up of plants of the cactus, agave, and yucca types. The general vegetation features of the country, the floristic elements, as well as the economic importance of the vegetation are presented.—J. M. C.

SEWARD has published descriptions of certain collections of fossil plants from Natal,[7] Victoria,[8] and Kashmir.[9] To be able to compare the floras and horizons of these regions with those of Europe and North America is looked forward to with great expectations, and every scrap of definite information is valuable.—J. M. C.

THE FOURTH PART of SCHNEIDER'S *Illustriertes Handbuch*[10] concludes Spiraeaceae, includes Rosaceae, and begins Drupaceae. There are forty-five text figures. The general character and scope of the publication are stated in the notice of the first parts (BOT. GAZETTE **39**:373. 1905).—J. M. C.

NOTES FOR STUDENTS.

THE LAST PAPER of GERASSIMOW[11] brings together concisely the principal conclusions of the interesting series of experimental studies on the cells of the Conjugales which have appeared in recent years. It will be remembered that by subjecting filaments of Spirogyra to a temperature at freezing point, or treating them for a short time to the anaesthetic influence of ether, chloroform, or chloral hydrate, GERASSIMOW was able to arrest the processes of mitosis at different stages, with the result that the protoplasm may become variously distributed in the daughter cells. (1) A daughter cell may be formed lacking a nucleus, but containing portions of the divided chromatophore in a peripheral layer of cytoplasm. (2) A single cell may contain the two daughter nuclei either separated

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[6] BRAY, W. L., Vegetation of the sotol country in Texas. Bull. Univ. Texas no. 60. pp. 24. *pls. 11.* 1905.

[7] SEWARD, A. C., Report on collections of Natal fossil plants. Second Rep. Geol. Surv. Natal and Zululand. Pp. 97–104. *pls. 4–5.* 1904.

[8] SEWARD, A. C., On a collection of Jurassic plants from Victoria. Records Geol. Surv. Victoria 13:155–210. *pls. 8–19.* 1904.

[9] SEWARD, A. C., and WOODWARD, A. SMITH, Permo-carboniferous plants and vertebrates from Kashmir. Memoirs Geol. Surv. India N. S. no. 2. pp. 14. *pls. 8–10.* 1905.

[10] SCHNEIDER, CAMILLO KARL, Illustriertes Handbuch der Laubholzkunde. Vierte Lieferung. Jena: Gustav Fischer. 1905. *M* 4.

[11] GERASSIMOW, J. J., Ueber die Grösse des Zellkernes. Beih. Bot. Centralbl. **18**:45–118. *pls. 3–4.* 1904.